

this opportunity and also the diligence to follow cases as Doctor Karshner has done. It is at the necropsy mainly that many of our earlier impressions about the pathologic conditions in juvenile tuberculosis are being corrected. While the roentgenogram is probably the most important single item in diagnosing clinical pulmonary tuberculosis in childhood, in certain cases it is of no value except when correlated with history, physical examination, and tuberculin test. It is known that the hilar shadows during convalescence from pertussis and measles, and in cases of chronic bronchitis associated with infection of the accessory nasal sinuses (sinobronchitis) often cannot be told from those seen in tuberculosis of the hilar lymph nodes.

Doctor Karshner mentions the interesting linear shadows frequently seen extending from hilum to periphery. In a series of roentgenograms recently observed by Doctor Garland and myself at Stanford, we found these shadows to be present in 51 per cent of 327 cases in which the children were known to be tuberculous, and also in 48 per cent of fifty cases in children reacting negatively to large doses of tuberculin. In the first group the linear shadows were sometimes close to the initial lesion, sometimes distant, and often no primary lesion could be demonstrated when these shadows were present.

COLON RESECTION*

By ERNST GEHRELS, M. D.
San Francisco

DISCUSSION by Robert C. Coffey, M. D., Portland, Oregon;
Foster K. Collins, M. D., Los Angeles.

IN colon resection the left side of the large intestine requires different surgical management from the right side. The one-stage operation for the right side of the colon, namely, the cecum and hepatic flexure, has generally been accepted as the best method, the ileum being planted into the remaining transverse colon. The left side of the colon presents a much more difficult problem. The two-stage operation for the left side of the colon was adopted by Paul in England and von Mikulicz in Germany. Their reason for this choice was the insecurity of colon anastomosis.

TWO-STAGE OPERATION FOR LEFT SIDE OF COLON

First Stage.—(a) The bowel is delivered outside the abdominal wall. (b) The bowel is usually resected a few days later so as to form a double-barreled artificial anus.

Second Stage.—Artificial anus is closed. Until recently, the majority of surgeons managed colon resections in this manner. Lately, however, an increasing number of surgeons prefer a three stage operation for all cases of cancers of the left side of the colon, both in ileus and in non-obstructive conditions.

THREE-STAGE OPERATION FOR LEFT SIDE OF COLON

First Stage.—An exploratory laparotomy is performed. If the case proves to be an operable cancer some type of cecostomy or colostomy is done.

Second Stage.—(Main operation)—Bowel resection and immediate end-to-end anastomosis. Sometimes in nonobstructive cases, the first and

second stages of this procedure are combined. A complete primary operation with a safety cecostomy is performed.

Third Stage.—Closure of preliminary cecostomy or colostomy. Rarely does a spontaneous closure of a cecostomy or colostomy occur. Spontaneous closure could hardly be expected, as this operation is done to keep all fecal contents from the left side of the colon.

The question of choice between one, two or three-stage operations must be considered.

To undergo three operations when one might suffice, is naturally a hardship for the patient. Surgeons generally acknowledge the one-stage operation to be of greater risk to the patient's life. For this reason the two or three-stage operation is preferred. The one-stage operation, however, is still frequently done by well-known surgeons, as by Moynihan in England.

Personally, I am opposed to the one-stage operation. At the present time I favor either the two or three-stage operation, as do the majority of French and American surgeons.

In Germany, at the 1926 Surgical Congress, the problem of colon resection was widely discussed. Several German surgeons showed a marked preference for the one-stage operation in nonobstructive cases. In the Mayo Clinic, the one-stage operation of the left side of the colon is rarely done. In 1924, the Mayo Clinic reports showed the Mikulicz procedure to have been used in 183 cases with a mortality of 9 per cent. Judging from the latest publications, a modified three-stage operation, with preliminary cecostomy or colostomy of the transverse colon is being frequently performed.

MIKULICZ PROCEDURE IN COLON SURGERY

It may be timely to review the entire problem and to determine the place of the Mikulicz procedure in colon surgery. As far as mortality is concerned, the Mikulicz procedure has the unquestioned advantage over every other method. The following statistics of the Mikulicz operations show up better than the best statistics with other procedures, for instance, the latest statistics of Rankin with a mortality of 12 per cent.

Surgeons	Cases	Operative Mortality Per Cent
Mikulicz	34	12
Mayo	183	9.6
Cruet	38	5.3
Quenu	74	8

The criticisms of the Mikulicz operation are largely based on the following:

- Insufficient removal of the bowel;
- Insufficient removal of the mesentery and the glands in the mesentery;
- Implantation of cancer into the abdominal wound;
- The Mikulicz operation is not sufficiently radical.

To avoid these dangers, it is necessary to do the first steps of the Mikulicz operation in one day and not several days apart. We excise the bowel immediately, at least two inches away from

* Read before the General Surgery Section of the California Medical Association at the fifty-eighth annual session at Coronado, May 6-9, 1929.

the tumor on each side, using the cautery over crushing clamps, which remain on each bowel opening for twenty-four to forty-eight hours. If we wait several days before excising the gut, retraction of the bowel occurs and the resection may take place too close to the tumor. Implantation may also result.

If immediate emptying of the bowel be desirable, a Paul tube is tied into the upper or both openings. The danger of peritonitis is negligible. F. Rankin has reported one case in which the upper bowel end slipped back and caused peritonitis. The danger of retraction can be avoided by sufficient loosening of the extraperitonized bowel.

In this procedure, the mesentery with its glands is immediately resected just as radically as in a one-stage operation or a three-stage operation. There is no reason why we should not mobilize the bowel and cut the mesentery to the same extent in a Mikulicz operation as in a one, two or three-stage operation. If done in this manner, the Mikulicz operation is not an incomplete operation. As far as permanent cures of cancer are concerned, the Mikulicz operation is not inferior to any other procedure. This fact has been demonstrated by large Continental experience.

The unpopularity of the Mikulicz operation has mainly been due to the difficulties in closing the double-barreled colostomy. As one well-known surgeon has put it: "The Mikulicz procedure may be safe, but it is slow and disagreeable."

The original procedure has two weak points:

1. The abolishing of the spur by the unsurgical procedure of the crushing clamp. This has often led to peritonitis and to secondary stenosis or ileus, to say nothing of the pain involved and the occasional hemorrhage.

2. The closure of the fecal fistula by an extraperitoneal plastic has often been unsuccessful, necessitating a second closure.

TECHNIQUE OF CLOSING THE ARTIFICIAL ANUS

The two weak points above outlined can be mastered by the technique described below. This technique, which was used in twenty-six

TABLE 1.—*Usefulness of the Mikulicz Method Under Different Pathological Conditions*

Condition	Mikulicz Operation	Reasons
Volvulus of cecum or sigmoid with gangrene.	Only possible method.	
Phlegmonous colitis, (most commonly of cecum).	Often indicated.	Bad condition of patient requires short procedure.
Irreducible intussusception.	Often indicated.	Bad condition of patient requires short procedure.
Diverticulitis.	Best procedure.	Perforation into bladder, (common complication of diverticulitis), etc.
Megacolon.	Best procedure.	Colon difficult to empty by cecostomy.

cases in Payr's Clinic, Leipzig, Germany, was published by me in the *Deutsches Archiv. fuer Klinische Chirurgie* in 1921.

The procedure I recommend avoids the crushing of the spur and closes the artificial anus in one stage, three to six weeks after the main operation. This allows sufficient time for the inflammatory edema of the peritoneum and intestines to subside.

The skin incision is carried around the double-barreled anus. The two edges are sutured to cover the colostomy openings. After changing gloves, the succeeding layers of the abdominal wall, fascia, muscle and preperitoneal fat are amply dissected. It is important to dissect the scar tissue of the preperitoneal fat extensively until loose preperitoneal fat is exposed all around. Only after this has been done, do we detach the two bowel ends from the parietal peritoneum, dissecting the intra-abdominal adhesions under the guidance of the left forefinger. We do not hesitate to open the abdominal cavity whenever it is necessary in order to loosen the two bowel ends so completely that an end to end union can be made without any tension. Increasing experience shows the danger of peritonitis to be small.

We have very little trouble with the spur. In the first place, we do not artificially establish a spur at the time of the first operation by parallel fixation. The short spur that is present disappears to a great extent after the two bowel ends have been detached from the abdominal wall, the intestine sinks back and the spur has disappeared. If there should be a spur formation remaining, it is only necessary to dissect a short distance between the two bowel ends and resect this part of the bowel wall. The union of the bowel is done with interrupted stitches, using silk for the outer layer. In this procedure, the only danger of leakage is at the anterior suture line. The danger is met by sewing the anterior suture line into the peritoneal wall, which is left open at this point. The abdominal wall is sutured in layers, leaving an opening for a rubber dam which goes down towards the suture line.

This whole technique may appear much more dangerous than the former extraperitoneal procedure. On the contrary, it has proved to be surprisingly safe. It can be done under local anesthesia.

As I have stated previously, I published from Payr's Clinic, twenty-six cases of artificial anus which had been closed by this technique. Sixteen more cases from the same clinic have been reported since, with no death, making forty-two cases with only one death. Only in three cases in the beginning of the series did a fecal fistula develop, which, however, closed spontaneously. This procedure has made the closure of an artificial anus in one sitting a reliable procedure.

It is easy to understand why this procedure is associated with so little danger:

In the first place, some adhesions are always left surrounding the operative area and reform very quickly postoperatively.

In the second place, the resistance of the peritoneum and abdominal wall against infection seems to be increased at this time, about four to six weeks after the main operation. It is surprising to see the abdominal wall unite by primary union in almost all cases.

In the third place, should leakage of the suture line occur, it will be in front, and a fecal fistula will result without general peritonitis.

This procedure is neither original nor new. Many surgeons are closing the artificial anus in the same way. In the textbooks and surgical publications on the Mikulicz procedure, the crushing clamp is still advocated. The fact that the type of procedure I have described is not only safe but considerably shorter, is at present not well enough known. Formerly the duration of the Mikulicz method averaged at least three months. Our procedure shortens the time to six weeks. I might describe this procedure as being midway between an entirely extraperitoneal and an entirely intraperitoneal one. It is often necessary to open the peritoneum all around. In five of our patients the peritoneal cavity was not opened at all. The main requirement is the same as it is in all attempts at closing a fistula at any point in the body, namely: to loosen the affected parts abundantly before attempting to sew them together.

COMPARISON OF ONE, TWO AND THREE-STAGE PROCEDURES

My experience does not accord with those surgeons who advocate a one-stage operation. In the one-stage operations, I have lost two out of four patients. Each time I have felt that I might have saved the patient had I resected in two stages.

In a collection of statistics of 136 cases of one-stage operation of the left side of the colon published by F. Nordmann, there was a mortality of 30 per cent. In my opinion this mortality is too high.

In comparing the advantages of the Mikulicz operation with the three-stage operations, the following points have to be considered:

First.—If a preliminary cecostomy is done blindly from a small right side incision without exploration, the case may prove to be inoperable later and there will be the disadvantage of a fecal fistula on the right side. Accordingly every operation, unless in the presence of acute obstruction, should begin with a wide incision and exploration. This makes the preliminary operation a fairly extensive one in the three-stage operation.

Second.—A cecostomy is not reliable for preparing the left side of the colon for the main operation. A cecostomy with a small catheter, as is sometimes recommended, will not suffice at all to empty the left-sided colon and the transverse colon, which after a cecostomy are often filled with hard fecal lumps. F. Rankin and Jones of Boston recommend the use of a half-inch tube for the cecostomy. In cases of severe obstruction, this is insufficient to empty the left side of the

TABLE 2.—*Usefulness of Mikulicz Procedure in Cancer in Various Locations of the Colon*

Site of Cancer	Mikulicz Operation	Reasons
Transverse colon.	Advisable.	Vascular supply of transverse colon unreliable.
Splenic flexure.	Advisable.	Operation usually difficult and long. Transverse colon sometimes hard to empty by cecostomy.
Descending colon.	Advisable.	
Upper sigmoid.	Advisable.	The suturing of the descending colon to the lower sigmoid is disagreeable, because descending colon has large posterior peritoneal defect.
Lower sigmoid.	Advisable.	Pelvic colon can be mobilized.

colon. Not long ago, I had an experience of this kind. In spite of the preliminary cecostomy, I found the left-sided colon still distended. Doctor Jones and other colon surgeons record this same experience. When we do the intestinal anastomosis in the Mikulicz method, the left-sided bowel is in a condition of complete collapse, and in perfect condition for suturing.

Third.—In the second stage of a Mikulicz operation, the parts to be united are free of any tension. Their blood supply is absolutely assured. In the three-stage operation, the bowel anastomosis is done after extensive cutting of the mesentery. In these cases, we know that the blood supply is uncertain. Especially in a stout individual with a fat mesentery, is it hard to be certain of the blood supply of the parts.

Fourth.—In the Mikulicz method, the entire procedure is divided into two nearly equal parts. In the three-stage operation, the second stage is a very extensive one; especially if the case be complicated by adhesions of the tumor to the small intestine, the bladder, the uterus, etc., requiring a resection of these parts. In these cases we are glad to put off the intestinal anastomosis until the peritoneum has had time to repair the extensive trauma.

Fifth.—The Mikulicz procedure, as I have described it, requires less time in the hospital and less expense to the patient than the three-stage operation.

The resection, with preliminary cecostomy, amounts to a three-stage operation. A cecostomy large enough to keep the left colon free from fecal matter, rarely closes spontaneously. A third operation is required for its closure. One of the arguments that may be given in favor of the three-stage operation is that it permits the employment of the so-called "aseptic technique" of colon anastomosis. The best "aseptic technique" will break down and cause leakage if the blood supply of the parts is insufficient. At present, the "aseptic technique" offers no inducement to abandon the Mikulicz procedure. The main argument in favor of the three-stage operation is the protection that the cecostomy affords to the suture line. In spite of this protection, it is not always possible to avoid leakage. The cause of leakage is just as

much a question of proper blood supply as it is of fecal tension. The safety of the colon suture in the Mikulicz method would be hard to surpass. In my opinion, the Mikulicz operation offers a safer union of the large bowel than any other method.

Three great factors make for the safety of the Mikulicz method:

1. The complete collapse of the bowel;
2. The lack of tension;
3. Assurance of perfect blood supply, and
4. (Incidentally.) The extraperitoneal operation.

MIKULICZ PROCEDURE IN ACUTE ILEUS

For acute ileus, Mikulicz abandoned the extraperitonization procedure. In these cases he did a three-stage operation, beginning with a colostomy. This was before the time of x-ray localization. Nowadays a barium enema before operation allows us to localize an obstructing tumor of the large intestine.

If a long-looped sigmoid with an obstruction at the highest point of the loop is demonstrable, I think it permissible occasionally to extraperitonize the loop and immediately establish the double-barreled anus with two Paul tubes. We always empty the colon before sewing the bowel into the peritoneum. In this way the ileus is more rapidly relieved than by a cecostomy.

SUMMARY

For the reasons I have outlined, I am doing a Mikulicz operation in the majority of cases. It is a mistake to enforce the Mikulicz operation in every case. If in opening the abdomen we find

1. A large growth with infection of the bowel wall and adjacent tissues, or
2. A growth associated with advanced obstruction, or
3. The patient in bad condition,

even the first stage of a Mikulicz operation may be too much for the patient's endurance. Under such circumstances, it is better to prepare the patient for the main operation by a preliminary cecostomy or colostomy, which I establish in order to divert the entire feces from the left side of the colon. The following step may be either a complete operation of bowel resection and anastomosis or the first stage of a Mikulicz operation in complicated cases.

The favorite locations for the Mikulicz operation are the sigmoid and the transverse colon. For the splenic flexure and especially the descending colon, it is sometimes better judgment to do a three-stage operation. It is best to approach these cases without a preconceived procedure in mind, and after proper exploration, to decide on whatever form of operation is indicated. Most of us are inclined to grow partial to one method. However excellent, one method does not fit every case. Certain cases of early malignancy may even permit of a complete one-stage operation. In such cases, I always add a small cecostomy or ileostomy as a safety measure.

In my opinion, the two-stage operation of Mikulicz deserves a dominating place in colon surgery. I recommend abandoning the crushing clamp and to do a resection of the artificial anus in the manner I have described. I feel sure you will like the Mikulicz procedure much better when done in this manner. I trust that Tables 1 and 2 may prove helpful.

490 Post Street.

DISCUSSION

ROBERT C. COFFEY, M. D. (611 Lovejoy Street, Portland, Oregon).—Concerning the importance of the Mikulicz operation, I am entirely in accord with Doctor Gehrels. It is, of course, ideal to do an immediate excision of the sigmoid or left-sided colon with direct end-to-end anastomosis. But, idealism in intestinal surgery is the most fatal of all sentiments, and no matter how much experience a given operator may have had or how skilled he may become he will have a greater mortality in doing ideal resections of the colon than he would if he used the Mikulicz principle. I think there is no doubt that the Mikulicz principle is the most important single contribution that has been made on the surgery of the large intestine.

I entirely agree with Doctor Gehrels as to the method of performing the first part of the Mikulicz operation. I appreciate that the splendid method which Doctor Gehrels has shown for closing the colostomy is entirely practical, but I do believe that it is entirely unnecessary to open the abdomen for the purpose of closing a colostomy wound.

In earlier years, in operating for appendicitis, when the operation was done very late and consisted of opening an abscess, it was not uncommon to have extensive fecal fistulae. At that time I published an article on "Remote or Indirect Subperitoneal Drainage in the Extraperitoneal Closure of Persistent Fecal Fistulae" in *Annals of Surgery*, June 1907. If a colostomy is made properly, it may be closed by this method with practically no danger at all. It is about as follows: An incision is made which extends from about two to three inches above and an equal distance below the fistula and is made to surround the fistula. The first incision goes through the skin and fat down to the aponeurosis. This layer of fat and skin is dissected off the aponeurosis for a distance of at least two inches on all sides. The aponeurosis and the muscle are similarly separated and similarly lifted so that there are spaces of at least two inches between all the layers of the abdominal wall, which extend in all directions. After this separation has taken place the fistula stands up like a crater coming off from its attachment to the peritoneum. It is trimmed off, turned in and sutured, and dropped back with the peritoneum. Silkworm sutures are then passed through the skin, fat, muscle, and aponeurosis and left untied. The various layers are then sutured individually, after which silkworm sutures are tied over a roll of gauze or through small segments of tubing. By this means, all the layers are held firmly together while the two-inch spaces all around the line of suture permit of drainage of all these planes to the tubes which are placed at the two ends of the incision down to the peritoneum. If the fistula is in the abdominal wall, where all the layers may be freely separated, this operation is almost 100 per cent successful. It has been described in a number of books and has been given particularly prominent space in the fourth edition of Moynihan's "Abdominal Operations."



FOSTER K. COLLINS, M. D. (1930 Wilshire Boulevard, Los Angeles).—The Mikulicz method of resection is a life-saving measure in conditions where an immediate, more prolonged operation might fail. It is particularly indicated and, I think, should usually be limited to those cases where a short portion of intestine is found so damaged that it cannot temporarily

be returned safely to the abdomen, and to the occasional small scirrhous carcinoma easily brought outside the abdomen. I feel we are much indebted to Doctor Gehrels for his timely and very comprehensive contribution on this method.

I agree that when cancer of the transverse or descending colon is found, whether totally or partially obstructing, an immediate resection is rarely indicated. In nearly all of my recent resections of any portion of the transverse or descending colon, I have first done a cecostomy. This not only prepares the patient by permitting the acute symptoms to subside, but acts as a vent for gases, preventing distention and a possible blow-out at the suture line after resection. A cecostomy also has the advantage of being well to the right, leaving a clean uncontaminated left abdominal field for a safe radical resection in usually about ten days.

In opening an abdomen for suspected cancer beyond the ascending colon, a left outer rectus incision will permit inspection and exploration to determine the location and involvement. If it is a case for resection and the involved portion can safely be replaced in the abdomen, my usual practice is to decide against a Mikulicz. I then insert my hand over to the right lower abdomen and determine where a knuckle of cecum can best be made protrude through an incision farthest to the right above the ileac crest. The incision through the abdominal wall is no longer than the knuckle of cecum requires for an ample protrusion and opening. Absorbable sutures placed in the outer coats of the cecum, peritoneum and fascia, secure the knuckle. No sutures are placed in the skin and there is no later infection. If the distention is acute and symptoms urgent, a drainage tube can be at once purse-stringed into the cecum as soon as the left rectus incision has been closed and protected by vaselin gauze. The left abdominal wall can be thus left free from contamination for the later resection. Through a large drainage tube in the cecum the colon is gradually washed out with saline and there is no contamination of the cecostomy dressing for three or four days. When the tube loosens, an ample opening is made and drains the entire colon quite satisfactorily with irrigation. This cecostomy opening, in my experience, either closes of its own accord or can be closed with a few stitches when it is no longer required, without entering the abdomen.

Doctor Gehrels states one of the main objections to the Mikulicz operation in cancer has been that it might not be radical enough—that involved glands in the mesentery may not be removed. It has been my experience that, as the operation is usually performed, this is true and I think a more open procedure is indicated in cancer cases, if, when the abdomen is first opened, it is found the involved section of bowel can be temporarily replaced.

In a resection the all-important points are: removal of involved glands, prevention of impaired circulation at the suture line to avoid a blow-out from necrosis and provision to prevent distention.

After resection, I usually do an end-to-end anastomosis by my aseptic technique published in the *Annals of Surgery*, December 1922; but safeguard this suture line from a blow-out by invaginating it into the gut below for an inch or so, suturing the gut wall from below up over the suture line. A tube is inserted through the anal canal, and, guided by the hand in the abdomen, passed up beyond the anastomosis several inches. With both tube and the cecostomy functioning there is no dangerous distention and rarely even a temporary fecal fistula at the point of resection. No drainage is employed. The average hospital stay is from three to four weeks from the time the patient first entered.

✻

DOCTOR GEHRELS (Closing).—We all agree on one point, that a one-stage operation on the left side of the colon is rarely advisable. The choice rests between a Mikulicz operation and a three-stage opera-

tion as Doctor Collins outlined. To compare the advantages of these two methods has been the object of this paper. In order to do colon surgery most successfully, a familiarity with both methods and their advantages is necessary. The choice of method will have to be determined by the anatomical findings in each individual case. For the majority of cases, I have found the Mikulicz operation most satisfactory when done in the way I have outlined.

It pleases me to hear that Doctor Coffey, with his great experience in colon surgery, is well satisfied with the Mikulicz procedure.

My experience with the crushing of the spur and the extraperitoneal closure of the resulting fecal fistula in the second stage of the Mikulicz operation has been less fortunate than Doctor Coffey's. This was the reason for ceasing to crush the spur, and for adopting the procedure which was described.

DIVERTICULA OF THE URINARY BLADDER IN WOMEN*

REPORT OF CASES

By JAY J. CRANE, M. D.
Los Angeles

DISCUSSION by Herbert A. Rosenkranz, M. D., Los Angeles; George F. Schenck, M. D., Los Angeles; J. C. Negley, M. D., Los Angeles.

IN the United States only five cases of diverticula had been reported prior to 1906, and these were in men. Since the advent of our present-day cystoscopic and improved roentgen ray technique, diverticula have frequently been seen. There is scarcely a clinic that has not reported a large series of cases. These reports have been very complete and extensive. In fact, there has been so much written regarding diverticula that it is not necessary to dwell on the subject in detail. However, since diverticula in women are relatively rare, comprising about 5 per cent of all reported cases, the three cases here reported were thought to be of sufficient interest to merit mention.

In attempting to prove the etiology of diverticula much careful study has been done by urologists but their opinions are still divided. Thus some believe that all diverticula are congenital; many believe that they may be either congenital or acquired; while still others contend that they are always acquired. It is true that nearly all of the diverticula seen in men are associated with obstructive lesions at or below the bladder neck. This fact also holds true for women. The three cases of diverticula and one case of an incipient diverticulosis are here reported because of their unusual occurrence in women and because of the definite symptom complexes and pronounced pathological findings.

REPORT OF CASES

CASE 1.—Mrs. E. M., Case 281731, Los Angeles General Hospital. Age 41.

Complaint.—Came for relief of: (1) difficulty in urinating; (2) pain over bladder region; (3) sand in urine; (4) hematuria.

* Read before the Urology Section of the California Medical Association at the fifty-eighth annual session at Coronado, May 6-9, 1929.